

What is claimed is:

1. A method of thinning a silicon wafer, comprising the steps of:  
placing the wafer into a process chamber;  
delivering ozone gas into the process chamber to oxidize a layer of silicon on

5 the wafer;

delivering HF vapor into the process chamber; and

etching the oxidized silicon layer with the HF vapor to decrease a thickness of  
the wafer.

- 10 2. The method of claim 1 wherein the HF vapor is delivered into the  
process chamber via a carrier gas.

3. The method of claim 2 wherein the carrier gas comprises ozone.

- 15 4. The method of claim 2 wherein the carrier gas comprises an inert gas.

5. The method of claim 4 wherein the inert gas is mixed with the ozone  
before the ozone enters the process chamber, such that the ozone and the HF  
vapor are simultaneously delivered to the wafer.

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6. The method of claim 2 further comprising the step of generating the HF vapor by flowing the carrier gas across a surface of an HF solution contained in a vapor generator.

5 7. The method of claim 2 further comprising the step of generating the HF vapor by bubbling the carrier gas through an HF solution contained in a vapor generator.

8. The method of claim 1 further comprising the step of generating the  
10 HF vapor by heating an HF vapor solution contained in a vapor generator.

9. The method of claim 1 further comprising the step of generating the HF vapor by mixing anhydrous HF gas with water vapor.

15 10. The method of claim 1 further comprising the step of generating the HF vapor by bubbling anhydrous HF gas into water.

11. The method of claim 1 further comprising the step of forming a condensate film of HF vapor on a surface of the wafer.

20 12. The method of claim 1 further comprising the step of removing the etched oxidized silicon from the process chamber via a system exhaust.

13. A method of thinning a silicon wafer, comprising the steps of:  
placing the wafer into a process chamber;  
delivering ozone gas into the process chamber to oxidize a layer of silicon on  
the wafer;

5 delivering anhydrous HF gas into the process chamber;  
spraying DI water onto a surface of the wafer simultaneously with the step of  
delivering anhydrous HF gas into the process chamber;  
dissolving the anhydrous HF gas into the DI water on the wafer surface; and  
etching the oxidized silicon layer with the dissolved anhydrous HF gas to  
10 decrease a thickness of the wafer.

14. The method of claim 13 wherein the ozone gas and the anhydrous HF  
gas are mixed with one another before being delivered into the process chamber.

15 15. The method of claim 13 further comprising the step of forming a  
microscopic aqueous boundary layer on the surface of the wafer with the DI water.

16. The method of claim 15 further comprising the step of dissolving the  
ozone gas into the microscopic aqueous boundary layer.

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17. The method of claim 13 further comprising the step of removing the  
etched oxidized silicon from the process chamber via a system exhaust.

18. The method of claim 13 further comprising the step of rinsing the wafer after the etching step is complete.

19. A method of thinning a silicon wafer, comprising the steps of:

5 placing the wafer into a process chamber;

delivering ozone gas into the process chamber to oxidize a layer of silicon on the wafer into  $\text{SiO}_2$ ;

delivering HF into the process chamber to react with the  $\text{SiO}_2$  layer and convert the  $\text{SiO}_2$  layer into  $\text{SiF}_4$ ; and

10 removing the  $\text{SiF}_4$  to thin the wafer.

20. The method of claim 19 wherein the HF is delivered into the process chamber in vapor form.

15 21. The method of claim 20 wherein the HF vapor is delivered into the process chamber via a carrier gas.

22. The method of claim 21 wherein the carrier gas comprises ozone.

20 23. The method of claim 20 wherein the removing step comprises exhausting the  $\text{SiF}_4$  in vapor form from the process chamber.

24. The method of claim 19 wherein the HF is delivered into the process chamber in aqueous form.

25. The method of claim 24 wherein the removing step comprises  
5 dissolving the  $\text{SiF}_4$  with an aqueous solution.

26. The method of claim 19 wherein the ozone gas and the HF are mixed with one another before being delivered into the process chamber.